XLII.—*On* Spirorbis: *Asymmetry of these Annelids and Phylogenic Connexion of Species in the Genus.* By MM. Maurice Caullery and Félix Mesnil*.

We have recently had occasion to examine a great number of *Spirorbes* from different parts of the globe (Channel, Arctic seas, Mediterranean, Cape Horn, Panama), some twenty species, of which many are new. From a study of these, both from the anatomical and phylogenic point of view, we have arrived at the conclusions which follow.

The genus *Spirorbis* belongs to the family Serpulidæ; it is easily recognizable by its calcareous tube, fixed to a support and rolled in a regular spire with contiguous whorls. The thorax of the animal comprises in general three setigerous rings, the last two having on each side only a ventral row of uncini. Then follows a long achetous region, enclosing ovules, followed by the abdomen, which is made up of eight to forty segments, of which some contain spermatozooids. The prostomium of the animal carries a crown of feathery branchiæ; one of the branchial rays is modified, deprived of pinnules, and terminated by a calcareous piece—the *operculum*—which closes the tube when the animal withdraws itself into it.

We have drawn attention for the first time to the adaptations and modifications in the anatomy of *Spirorbis* induced by its habitat in the interior of a spiral tube. *These Annelids have become entirely asymmetrical*, of which the facts which follow are the proof:—

1. The direction of the turn of the spire is constant for a given species. We have called this *left-handed* in species in which this turning, considered in relation to the free face of the tube, has the same direction as the hands of a watch; *right-handed* when the turn is in the reverse direction. Now in the right-handed species the operculum is always borne by the second branchial ray on the right, starting from the medial dorsal line; in left-handed species it is borne by the second on the left. It is also always found on the concave side of the animal.

2. The longitudinal muscular fibres are much more developed on the same concave side.

3. The viscera (digestive tube, ovary) are thrown towards the concave side.

4. The uncini on the thorax and abdomen are larger and more numerous on the concave side.

5. The abdomen presents, as a rule, *n* rows of uncini on

* From the 'Comptes Rendus,' tom. cxxiv. pp. 48–50.

the convex side and $n+p$ rows on the concave side, where $p=2$—4.

6. We find a series of species, both right- and left-handed, in which the thorax presents, *on the concave side only*, a third row of uncini, representing a *fourth thoracic setigerous ring*, otherwise absent. In *Sp. cancellatus*, Fabr., this ring carries besides on the concave side dorsal bristles.

This group of arrangements shows in the clearest manner possible the influence of the spiral twist in the tube. All can be explained by the movements made by the animal. It is by thrusting itself by means of the uncini of the concave side against the calcareous wall of the tube that it emerges from it or retires. The greater activity of the organ of locomotion on this side has brought about their greater development, and the viscera have been thrown to the opposite side. This is especially obvious in the ovary; the ovules in course of maturation are always on the convex side.

We recognize that a natural (phylogenic) classification of *Spirorbis* should have for its basis the direction of the twist in the tube and that in each of the two series, right- and left-handed, must be grouped the species provided with a fourth setigerous thoracic ring on the one hand, and, on the other, those in which this does not exist. From this results the division of *Spirorbis* into four subgenera:—

Right-handed species	3 setigerous thoracic rings	.....	*Dexiospira.*
	4 „ „ „	.....	*Paradexiospira.*
Left-handed species	3 „ „ „	.....	*Læospira.*
	4 „ „ „	.....	*Paralæospira.*

Lastly, we have been able to further define the phylogeny of the group by the consideration of certain anatomical characters, such as the form of the bristles of the first and third setigerous thoracic rings, the modifications of the operculum, especially in the cases in which it functions as an incubating organ.

On all these matters, and also for the new species we have created, we would refer to our detailed memoir on these animals.

Note by M. Edmond Perrier *on the above Communication* *.

The observations of MM. Caullery and Mesnil have considerable interest from the point of view of the precise

* 'Comptes Rendus,' t. cxxiv. pp. 50–51.

determination of the relation between Mollusca and Vermes. The early notions on this subject extend far back; it has been set forth in various ways more or less explicit since 1844 by Quatrefages, P. J. van Beneden, Carl Vogt, de Lacaze-Duthiers, Mörch, Gegenbaur, von Ihering, Giard, Hatschek &c.

In 1881 ('Les Colonies animales,' p. 631 *et seq.*) I endeavoured to approach more closely than my predecessors the question which I had already treated in my course at the Museum in 1877, and to define the resemblances of the Gasteropods, considered as the basis of the Mollusca, to the tubicolar Annelids. I remarked in particular ('Les Colonies animales,' p. 640) that the cephalobranchiate Annelids present, like the Gasteropods, "numerous traces of asymmetry; the Spirographs have one of the cephalic branchiæ almost entirely atrophied. Normally in the Serpulidæ there should be two opercular appendices, usually but one is developed. The twist of the spiral, so frequent in Gasteropod Molluscs, is found among the Annelids in *Spirorbis*." This twisting is complicated, according to the interesting researches of MM. Caullery and Mesnil, by an asymmetry external and internal of the most marked kind, and which is equally characteristic of Gasteropods. The resemblances of Mollusks to cephalobranchiate Annelids is thus strongly accentuated; they are, in truth, in part the resemblances of convergence. Is it now permissible to attribute the asymmetry of *Spirorbis* entirely to adaptive modifications in their anatomy induced by their habitat in the interior of a spiral tube? There are certain distinctions to be drawn. We have seen already that there are very clear indications of asymmetry in the Serpulidæ whose tubes are not spiral; on the other hand, it is the *Spirorbis* which has constructed its tube, and this tube cannot roll itself into a spiral by reason of an asymmetry already existing, partly at least, in the animal which has produced it. This initial asymmetry is no doubt due to an active cause like that which shows itself in Mollusks (Perrier, 'Traité de Zoologie,' p. 2071); once the tube is formed, it can accentuate itself by reason of the special conditions of existence it imposes on the animal. But it is essential to remark that these things do not occur here as in the Paguridæ, which have adapted for their habitation helicoidal tubes already made.